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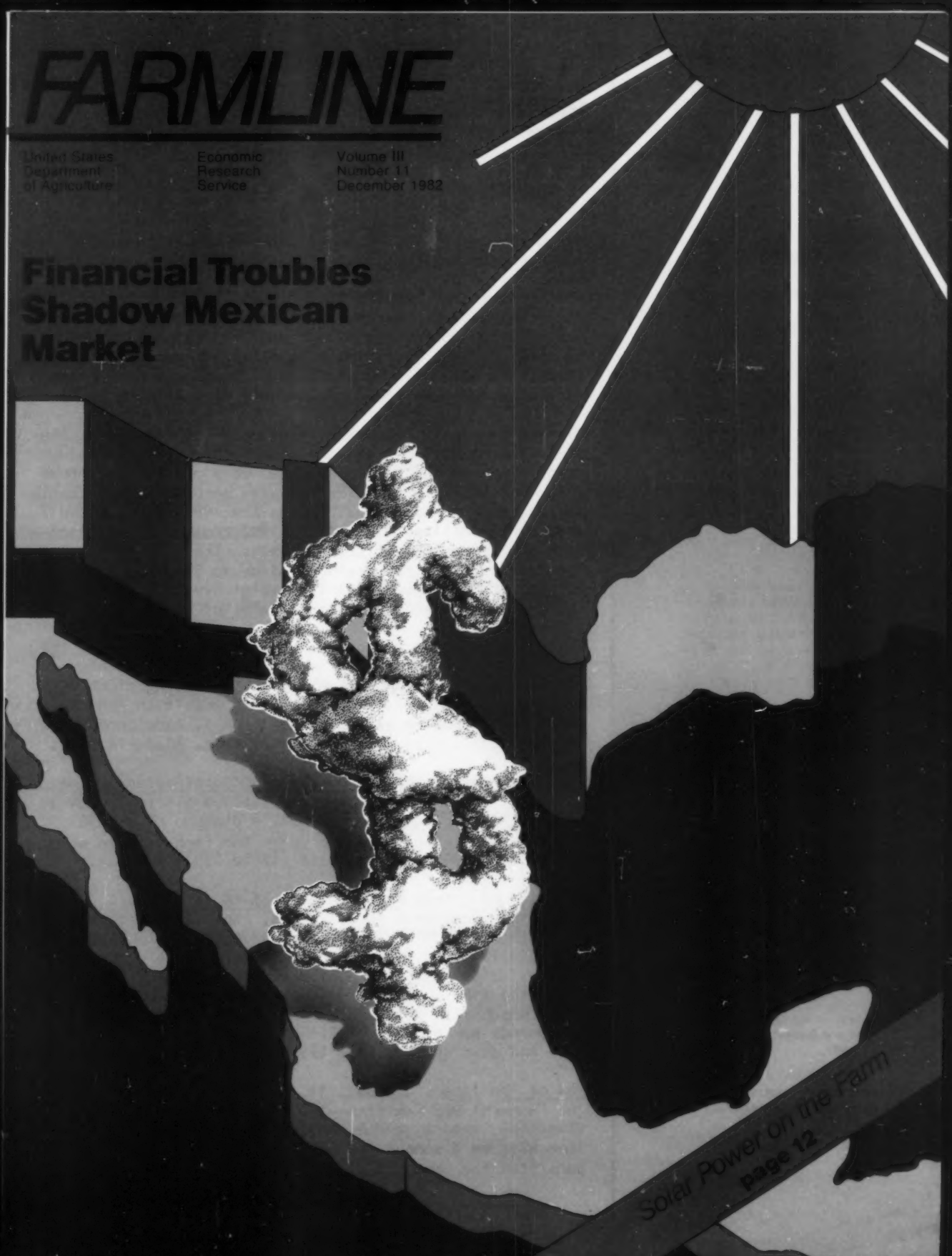
Financial Troubles Shadow Mexican Market



Solar Power on the Farm
page 12

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PERSPECTIVES

Quick changes in Soviet trade policies don't seem likely under new leader Yuri Andropov. The USSR is expected to stick to goals of diversifying its suppliers, improving its agricultural base to limit dependence, and slowly upgrading diets. There's been virtually no progress on the last two goals, and Andropov might feel more pressure to show results. But without a basic reordering of priorities, the USSR will remain heavily dependent on imports for years to come--though needs will vary with harvests.

Mystery figure #2 . . . For the second year in a row, the Soviets are keeping their grain production figures under wraps even though they're supposed to provide the numbers under U.S.-USSR information exchange agreements. Probable motive: embarrassment. USDA pegs the 1981 Soviet grain crop at 160 million tons, their 1982 crop at 180 million--both are far below official targets. The U.S. recaptured the No. 1 slot as top grain supplier to the USSR in 1982, but our share--about a third of total Soviet grain imports --doesn't match the pre-embargo level of over 50%.

French only is now the rule as France tries to reduce its trade deficit with a language restriction. Shipments, particularly from the United States, are being blocked if markings, labels, and trade documents aren't in French. France was a $624-million market for U.S. farm products and a $7-billion-plus market for all U.S. goods in 1981.

Look for another drop in U.S. agricultural export value in fiscal 1983. Current forecast: $37.5 billion. But volume should rise some from 1982's disappointing 158 million tons. Twelve growth years for farm exports were broken when 1982 earnings slid 11% to $39.1 billion.

Retail food prices may rise only 3%-6% in 1983 . . . This year, they increased about 4-1/2%, the smallest annual gain since 1976 and well below the double-digit jumps of the late 1970's. Comparing 1982's food price rise with the inflation rate, the real cost of food actually dropped --for the 4th year in a row. At the same time, per capita food consumption fell again. Red meat eating slumped to 149 pounds per person retail-weight basis, lowest since 1965 and down sharply from 1971's record of 170 pounds.

End of the line . . . Dec. 31, 1982, is the last day for the Farmers' 900 Newsline--the phone-in service for crop, livestock, export, and economic news from USDA. The 900 line will be disconnected because of changes in rules that permitted the cooperative project between USDA and AT&T.

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The devaluation of the Mexican peso is part of an effort to get a debt-laden, dollar-short economy back on its feet, but the consequences are not confined to Mexico alone. A lower valued peso makes U.S. farm goods more expensive for Mexicans, who are major export customers. Economist Donna Roberts examines Mexico's financial plight and the implications for U.S.-Mexican trade.

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Dairy surpluses are at record levels and still rising, so the big question is whether the new dairy legislation will help bring supplies and demand back into balance. The answer is in the hands of producers, says economist Cliff Carman. It all depends on how they respond. Trouble is that output-boosting market signals may compete with the disincentives of the deduction plan.

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Casein has not been commercially produced in the United States since 1968. Instead, all the casein is imported, even though demand is as strong as ever. Why has domestic production dried up? And why the fuss over imports? Analyst Felix Spinelli looks at the economics of this versatile product, its sources and uses, and the controversy it generates.

The Woman's Role in Agriculture *by Martha R. Evans* 10

While homemaking still ranks high on their do-lists, many farm women are running tractors, caring for livestock, and balancing operating budgets. A recent study looked into the responsibilities and attitudes of farm women. It provides fresh evidence of the varied and significant roles they play in the operation of U.S. farms.

Solar Power on the Farm *by Leland Scott* 12

Solar power still cannot compete with conventional energy for most farm uses, but the future may tell a different story. Many existing systems have already proven their worth, and the emerging solar technologies hold more promise. Economists Walter Heid and Warren Trotter explore the advances and obstacles in developing cost-efficient solar systems for agriculture.

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Financial Troubles Shadow Mexican Market

The devaluation of the Mexican peso has been a windfall for American tourists, but its causes and its consequences have far deeper implications for both Mexico and the United States.

The devaluation is part of an effort to get a debt-laden Mexican economy back on its feet. The United States is lending support to that effort because a healthy Mexican economy is judged to be in America's best interests, too.

Nevertheless, the immediate impact of the devaluation is not encouraging for U.S. export prospects. Although sales of U.S. agricultural products to Mexico are still expected to rise in the year ahead, they would probably be stronger without the devaluation.

For the last few years, Mexico has tried to finance an ambitious economic development program with its oil wealth. However, oil prices did not follow the expected upward path. With the global oil glut, oil revenues began to drop, and Mexico had to increase international borrowing to maintain its high investment in the economy. Foreign debt rose from $39 billion in 1979 to $78 billion by 1982—one of the highest debt levels in the world.

Then the financial crunch hit early this year, temporarily derailing plans for development. Faced with a huge debt, high interest rates, and oil earnings that weren't growing as anticipated, the Mexican government realized that it could no longer support the foreign exchange value of the peso. In February, Mexico withdrew from the exchange markets, and the peso fell to 45 per U.S. dollar from 25 per dollar in 1981.

In August, the government decided it couldn't continue to meet payments on its foreign debt, and a second devaluation dropped the peso to a rate that fluctuated between 95 and 130 per dollar. In September, one week after the Mexican government nationalized the country's banks, the peso was fixed at an official rate of 70 per dollar, where it has remained. (Mexican currency exchange houses on the border with the United States are permitted to trade pesos for dollars at the higher, free market rate. This helps Mexico compete with U.S. exchange houses for dollars from tourists and others crossing the border.)

What Devaluation Does

The purpose of devaluation is to increase Mexico's foreign exchange earnings and put a lid on its foreign debts by reversing the flow of capital out of Mexico. A lower valued peso encourages Mexican exports by making them less expensive for foreign buyers. At the same time, it discourages imports by making them more expensive for Mexicans.

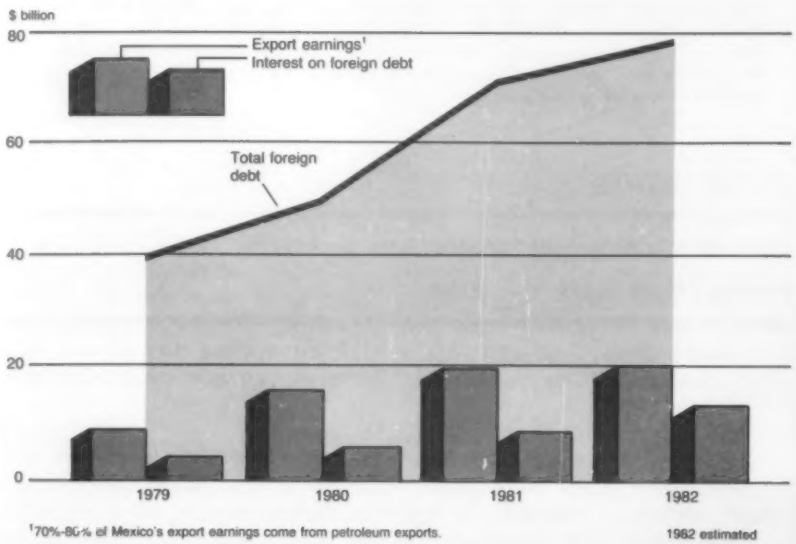
Because the value of the peso is tied to the U.S. dollar, Mexico's exports had been growing more expensive for many foreign customers as the U.S. dollar's value rose on world money markets.

The potential trade implications of the devaluation are evident in U.S.-Mexican currency exchange rates. For example, 100 pesos bought roughly $4 worth of U.S. products in 1981, but the same 100 pesos buys only about $1.43 worth of U.S. exports now. Likewise, from a U.S. importer's point of view, $100 bought 2,500 pesos' worth of Mexican products last year, but now buys 7,000 pesos' worth—nearly three times as much. (Mexican oil isn't affected, because oil is priced in dollars.)

"The devaluations will give Mexican exports an initial surge," says economist Donna Roberts of USDA's Economic Research Service. "However, this will be offset somewhat by increased prices for the imports essential to Mexican industries."

Roberts also points out that the effects of the devaluation will be eroded by Mexico's high inflation rate, which is expected to reach about 90 percent this year. As prices of Mexican products catch up with the devaluation, they will lose their competitive advantage.

As Foreign Debt Doubles, Interest Payments Eat Up a Major Share of Mexico's Export Earnings



[1]70%-80% of Mexico's export earnings come from petroleum exports.

1982 estimated

The new exchange rates will not affect all products equally, because a two-tier exchange system was established. Under this system, Mexico's central bank subsidizes the peso at the preferential rate of 49 to the dollar for importers of certain foods, capital goods, and other items that the government considers essential. The 70-pesos-per-dollar rate applies to all other imports.

"What all this means is that Mexican exporters will earn nearly three times as much for the products they ship. An export item worth a dollar on the world market will return 70 pesos instead of 25, the former exchange rate. But industry will pay twice as much for essential imports (49 pesos per dollar value instead of 25). At the same time, Mexican consumers will pay nearly three times as much for nonessential imports," Roberts says.

Therefore, although all U.S. exports to Mexico will be more expensive, items that fall into the preferential category—such as certified seed and breeding stock—will increase in price less than those that don't qualify for the special exemption.

Impact on U.S. Sales

All this presents a mixed picture for agricultural trade. During the last few years, Mexico has ranked among the top customers for U.S. farm exports, buying large quantities of U.S. corn, soybeans, wheat, grain sorghum, dry beans, and other products. Mexico was our number two market in fiscal 1981.

"In both the 1980 and 1981 trade years, Mexico was a more than $2 billion market for U.S. agricultural commodities, a big jump from only about $600 million in 1977," says Roberts. "But, for the 1982 trade year that just ended on September 30, the value of U.S. farm exports to Mexico fell 45 percent, from 1981's $2.7 billion to an estimated $1.5 billion."

The 18-percent increase in Mexico's 1981 grain and oilseed harvests was a major reason behind the drop in imports, but the country's economic ills were also a factor. The impact of the devaluation on future U.S. sales, though difficult to predict, will probably vary by commodity.

Mexico has a dual trade system. The government imports basic and bulk agricultural commodities, while the private sector purchases a wide variety of items, from almonds to yeast. According to Roberts, the devaluations may have the greatest impact on private sector imports because many products in this category don't qualify for the preferential exchange rate.

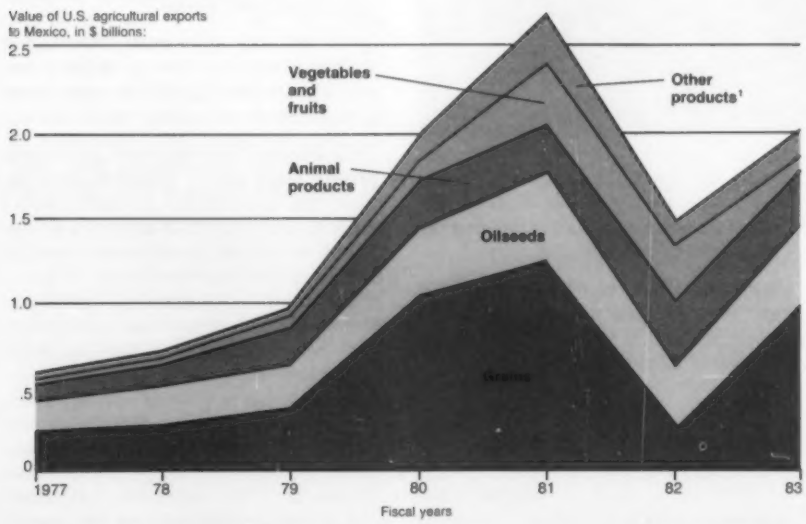
From January to September, U.S. exports in this category fell 19 percent from a year earlier. Apples and tree nuts were among the hardest hit by the devaluations.

Most bulk commodities, such as corn and wheat, are purchased by the government with dollars earned from petroleum sales. Even so, because of Mexico's large 1981 production and big stocks, government purchases during January-September dropped 63 percent from a year earlier. Imports of U.S. grains slid to 1.2 million tons, down from 5.5 million during the same months of 1981.

"Although the devaluations contributed to lower Mexican purchases, other factors played more important roles. Of course, this doesn't mean that we won't see the devaluations affecting 1983 purchases," Roberts says.

"For bulk commodities, the 1983 trade year should bring a return to larger sales," she predicts. "The expected purchase of 6–10 million tons of U.S. grains and oilseeds should push Mexican imports back to the $2 billion mark. Smaller 1982 harvests and lower stocks will bring about the increase. However, the export forecast might have been even larger if Mexico had more foreign exchange to spend and no peso devaluations."

After Two Years of Dramatic Growth, U.S. Farm Exports Fall 45% in 1982—Some Recovery Expected in 1983



¹Includes sugar, seeds, feeds and fodder, nuts, etc.

1982 estimated, 1983 forecast

A Boost For Mexican Growers

While the devaluations tend to put a damper on U.S. exports to Mexico, they also make Mexican goods more attractive to U.S. importers.

Recent estimates indicate that U.S. agricultural imports from Mexico rose to $1.1 billion in the 1982 trade year, up about 4 percent from 1981. Larger purchases of Mexican coffee, fruit juices, and fresh fruits and vegetables were recorded. Mexican tomatoes are one important product that may have benefited from devaluation.

Florida and Mexican growers have been engaged in an extended tug-of-war over who will supply more fresh vegetables—particularly tomatoes—to U.S. markets during the winter. In fact, the battle has been so heated that Florida growers have taken Mexican producers to court, claiming that the Mexican farmers are "dumping" winter vegetables on the U.S. market. The court case has yet to be decided.

According to ERS economist Glenn Zepp, the recent peso devaluations give Mexican growers a temporary edge. Over time, supply-price inflation usually accompanies devaluation, and costs catch up with grower prices. Farmers have to pay more for inputs and labor, so their extra profit from exports is eaten away.

"The devaluations improve Mexican growers' competitive position for at least a year or two," Zepp says. "Growers receive more pesos for vegetables sold in the U.S. market. This not only encourages them to divert more of their crop to the United States, but it also allows them to continue making a profit even if larger market supplies depress prices."

February's devaluation may have contributed to the 5-percent rise in U.S. tomato imports from Mexico during the first 9 months of 1982. However, the 17-percent increase in Mexican tomato production was the biggest factor in stepped-up shipments.

"Although exchange rates affect the tomato trade, weather remains a more important factor during any given year," Zepp says. "For example, the August 1976 devaluation gave exports a boost during the winter of 1977, but it was a disastrous Florida freeze that made Mexican growers the sole suppliers for the U.S. market for 3 months.

Agricultural Production Threatened

Mexico's financial difficulties discourage purchases of U.S. goods, but they also place that country's agricultural plans in jeopardy. Mexico's farm sector is supported by a multifaceted program known as SAM (Sistema Alimentario Mexicano, or the Mexican Food System). Backed by oil revenues, SAM is designed to increase domestic production and upgrade Mexican diets through large price supports to farmers and low retail food prices.

Under SAM, self-sufficiency in corn and bean production was targeted for 1982, with self-sufficiency in other crops projected for 1985. The combination of SAM and good weather pushed the 1981 crop of corn up 20 percent and dry beans up 44 from 1980 harvests.

However, 1981 was an exceptional year, and this year's picture is not as bright. In fact, estimates indicate that production of grains and oilseeds fell dramatically, from 22.9 million tons in 1981 to about 16.6 million this year.

"Whether the 1981 crops brought self-sufficiency is debatable, but this year's financial and production problems make the issue purely academic," Roberts says.

"Financial difficulties are going to preclude the government offering as much assistance to farmers this year. The government is providing increases in support prices of 20 to 30 percent, but these won't keep up with the 90-percent inflation rate estimated for 1982," she notes.

A Hard Road Back

With a little help from its friends, Mexico is struggling to get its economy back to normal. USDA's Commodity Credit Corporation has provided Mexico with $1 billion in loan guarantees (these encourage private banks to provide financing because repayment is assured by the U.S. government) for the purchase of U.S. agricultural products. In addition, the U.S. government has made an advance payment of $1 billion for future deliveries of Mexican petroleum.

Mexico has asked the International Monetary Fund (IMF) for a $4 billion loan and has requested an additional $800 million from a special emergency IMF fund. Meanwhile, the central banks of several industrialized countries have agreed to extend more credit and to give Mexico a 90-day grace period on loans now coming due.

Even with the assistance, Mexico will still be a long way from economic recovery and renewed growth in agricultural production.

"We expect zero-percent economic growth next year," Roberts predicts. "So, the farm sector probably won't grow much, if at all. Of course, a lot depends on rainfall. Mexico was having a dry year, but Hurricane Paul replenished northwest Mexico's irrigation reserves to some extent this October. So, the agricultural outlook remains uncertain." □

[Based on special material provided by economist Donna Roberts, who analyzes Mexican agriculture and trade prospects for the International Economics Division, Economic Research Service.]

The Dairy Deduction Plan: Will It Work?

A big question in the dairy industry is whether the new dairy legislation will help bring supply and demand back into a reasonable balance. Dairy surpluses are at record levels and still growing.

Congress amended dairy provisions of the Agricultural Act of 1949 when it passed the Omnibus Budget Reconciliation Act in September. Under the amended law, the minimum support price remains at $13.10 per cwt (hundred pounds) until October 1984.

In addition, USDA is authorized to collect from producers 50 cents for every hundred pounds of milk sold. This applies if CCC net dairy purchases under the price support program are likely to reach at least 5 billion pounds, milk equivalent, during the marketing year.

An additional deduction of 50 cents per cwt is permitted beginning April 1, 1983, if net government purchases are expected to go over 7.5 billion pounds. The second deduction, however, must be refunded to those producers who reduce their output by a specified amount.

The assessments have a twofold purpose: to encourage producers to trim production, and to help pay the rising costs of the dairy program, under which the CCC buys up excess supplies of dairy products. These costs rose from around $250 million in fiscal 1979 to $1.3 billion in 1980, nearly $2 billion in 1981, and an estimated $2.3 billion in fiscal 1982, which ended September 30.

USDA officials announced that the initial 50-cent deduction would begin on December 1, 1982. Net CCC dairy product purchases are currently projected to reach around 14 billion pounds, milk equivalent, in the 1982/83 marketing year—well above trigger levels for both deductions. (Net CCC purchases include purchases minus unrestricted sales back into the commercial market).

Impact on Output

"Dairy farmers' response to the deductions will play a key role in determining 1983 milk production," says dairy analyst Cliff Carman of USDA's Economic Research Service. According to Carman, the success of the deduction plan will depend on how soon and how much it influences the decisions of dairy producers.

The success of the deduction plan depends on how soon and how much it influences producers' decisions.

"If producers react quickly and start to reduce their herds, milk production in late 1983 could be down from 1982's late summer and fall levels. That would probably leave total output about 1 percent larger than it was this year," he says. "On the other hand, if producers wait until the spring flush production period before they take any steps to trim output, 1983 production will show a larger increase—perhaps 2 or 3 percent."

Milk production this year is estimated at about 135 billion pounds, up 2 percent from 1981's record. Economic factors have favored expansion even though prices received by farmers have been running below year-earlier levels.

Part of the explanation involves weak prices for grains and other crop commodities, and a tight off-farm job market. The lack of attractive alternatives has helped keep resources in dairying, giving dairy farmers more time to devote to milk production and leaving them more dependent on the income it provides.

At the same time, low feed prices and favorable milk-feed price ratios have encouraged an expansion in the dairy herd and continued heavy concentrate feeding, resulting in increased output per cow.

The output-boosting market signals will compete with the disincentives provided in the new dairy legislation, Carman says, but producers will still feel the impact of the deductions.

"Given the 50-cent deduction on December 1 and a second deduction starting next April, the effective returns earned by farmers per cwt of milk could decline more than 7 percent from a year earlier by mid-1983," he estimates.

Together, both deductions would cover about $1 billion of dairy program costs in fiscal 1983. Total cost of the program is estimated at $2.3 billion, the same level as in 1982.

Growing Inventories

Meanwhile, CCC dairy inventories are at record levels and still rising. The government now owns about 400 million pounds of butter, 800 million pounds of cheese, and 1.2 billion pounds of nonfat dry milk. Measured on a milk-equivalent, fat-solids basis, that comes to more than 16 billion pounds in CCC dairy inventories.

These inventories are growing faster than they can be distributed through restricted sales and USDA donations (school lunch plans, cheese giveaways, and other programs). CCC dairy stocks rose about 2.5 billion pounds in fiscal 1981 and 6.4 billion pounds in 1982. Another 5.7 billion pounds may be added to inventories in the current 1983 fiscal year, bringing total stocks to about 22 billion pounds.

However, if the deductions cause dairy farmers to cut back on production, net additions to inventories and dairy program costs would drop substantially in fiscal 1984, which begins next October.

When will inventories start moving in the opposite direction—down? That depends on dairy farmers' production decisions, growth in domestic demand, and the success of programs designed to spur dairy product exports. □

[*Based on material provided by Clifford M. Carman, dairy economist with the National Economics Division, Economic Research Service.*]

The Casein Question

Casein has not been commercially produced in the United States since 1968, even though demand is as strong as ever. Instead, all the casein is imported, at a cost of nearly $150 million last year.

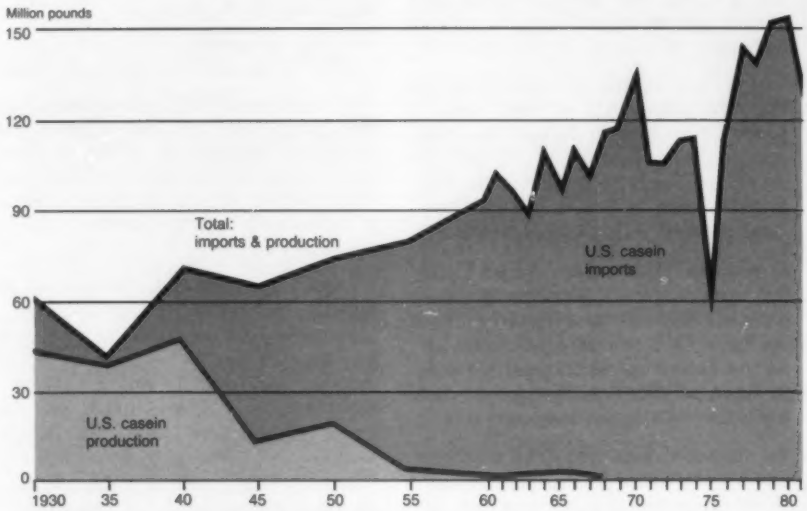
U.S. imports of this common milk protein dropped in 1981, but this year's imports probably recovered. Moreover, the trend clearly points in an upward direction. Between 1978 and 1981, imports averaged 142 million pounds a year, well above the average of 115 million pounds in the early 1970's.

So why has domestic production of casein dried up? The major reason is the relative profitability of producing other skim milk-based dairy products, especially nonfat dry milk (NDM). At least in part, this is due to the government's dairy price-support system that sets a floor price for NDM and buys up any surplus NDM stocks.

It takes roughly three times as much skim milk to produce a pound of casein as it does to produce a pound of NDM. Since NDM is worth close to $1 a pound to processors (the support price is 94 cents), casein would have to sell for at least $3 a pound to make it as economically attractive to produce as NDM. At that price, American casein would be out of the ballpark because imported edible casein is usually available at $1.50 a pound or less.

As a result, U.S. processors have not considered resuming casein production, and many even expanded their NDM production capacities. This raises another serious problem because markets for NDM have been shrinking for years.

U.S. Casein Production Dwindles to Zero, While Imports Grow



Charges Against Casein

Although several factors are involved in the decline in NDM use, many dairy producers and organizations contend that casein imports have contributed by replacing NDM—as well as other domestically produced skim milk by-products—in various foods and feeds. They also object that casein serves as a key ingredient in substitute dairy products, such as imitation cheeses, coffee whiteners, and artificial dessert toppings. Based on these charges, a number of groups pushed for government restrictions on casein imports in 1979, 1980, and 1981.

In addition to the concerns of these groups, questions were raised about casein's role in the cost of USDA's dairy program (do casein imports increase program costs by encroaching on dairy markets and creating larger dairy surpluses?). This became especially important in view of the government's large purchases of U.S. dairy surpluses in recent years.

The House Ways and Means Committee looked into the casein issue in 1979, USDA did a study in 1980, and the International Trade Commission conducted a Section 22 investigation (under import provisions of the Agricultural Adjustment Act of 1933) last year. Many observers thought the issue had been settled when the International Trade Commission concluded its investigation. It ruled that, despite some displacement of domestic production, casein imports did not have a significant impact on the U.S. dairy industry or on the government's price support program.

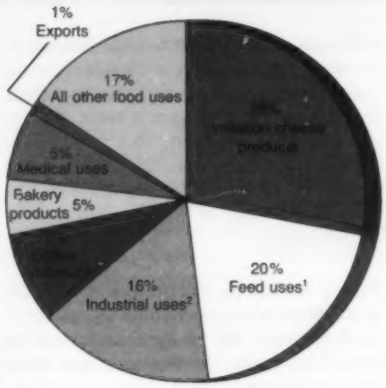
Earlier this year, however, the Secretary of Agriculture proposed a 10-point emergency dairy package designed to bring balance to the nation's dairy program. The casein question was again on the list. Specifically, the focus of the current casein study is on the trade practices of casein exporting countries. At issue is whether these countries are subsidizing the export prices of their casein, thus giving them an unfair advantage in the U.S. market.

Normally, about half the casein used in this country comes from New Zealand, another fourth from the European Community, and the rest from Australia, Eastern Europe, and elsewhere.

The Product and Its Uses

Simply, casein is a protein that com-

Casein Imports Find Many Uses



1980 data

¹Calf milk replacers, veal feeds, pet foods, etc.
²Glues and adhesives, paper products, etc.

prises four-fifths of whole milk's total protein. Whole milk is 87 percent water, 3.8 percent milkfat solids (butterfat), and 9.2 percent milk-solids-not-fat material—4.9 percent lactose, 3 percent casein, 0.6 percent whey, and 0.7 percent minerals and vitamins.

In its commercial form, casein is extracted from skim milk (milk with butterfat removed) in a process that separates it from other milk-solids-not-fat material. Further processing results in a white powder. That's casein, one of the most versatile amino acids known to man. It can be recombined with dried whey to simulate NDM (which is produced by drying skim milk), or it can be used separately to provide the nutritional and functional needs of other foods.

Although it has traditionally been classified as an industrial chemical, casein's food and feed applications have far surpassed its industrial uses since the mid-1970's. By 1980, about 60 percent of the casein imported by the United States went into food products, 20 percent in feeds (mostly in veal milk replacers and feeds), and 20 percent in industrial products and medical uses.

Casein's major attribute is its ability to bind compounds. In fact, it was used as a glue in ancient museum pieces and in wooden backs and frames of Renaissance paintings. In its current industrial uses, it goes into the production of glues and adhesives, paints, paper coatings, and insecticide sprays.

In the early 1970's, casein's binding role in the cheesemaking process was adopted by food technologists when they came up with the first imitation cheese products. These imitation products relied on casein's ability to bind together the two major ingredients (vegetable fat and water), in the same way that casein is used to bind butterfat and water to make natural cheese.

Today, manufacturers of imitation cheese make up the largest market for casein—taking an estimated 41.9 million pounds in 1980. Manufacturers of convenience foods, such as frozen pizzas and tacos, and many fast food chains appear to be the major users of imitation cheeses.

Another important trait of casein—its ability to emulsify fats and other complex chemical compounds—has made it a popular ingredient in cream substitutes. Many coffee whiteners are made with casein, often in convenient powder form.

Although the properties of casein help explain its popularity, cost obviously plays a major role in manufacturers' decisions to use casein over other substances. Casein was priced, on a protein equivalency basis, at one-half the price of domestically produced skim milk solids in 1980. This price difference was mainly due to lower milk production costs in casein-exporting countries.

One of our major suppliers, the European Community (EC), heavily subsidizes its casein production, but recent figures indicate that 3 out of every 4 pounds of casein imported by the United States originate in countries outside the EC. For the most part, these countries are New Zealand and Australia, which are both able to produce milk much more cheaply than in the United States. The main reason: their lower feeding costs due to year-round grazing. □

[*Written by economist Felix Spinelli, a policy analyst with the National Economics Division, Economic Research Service.*]

Assessing the Impact

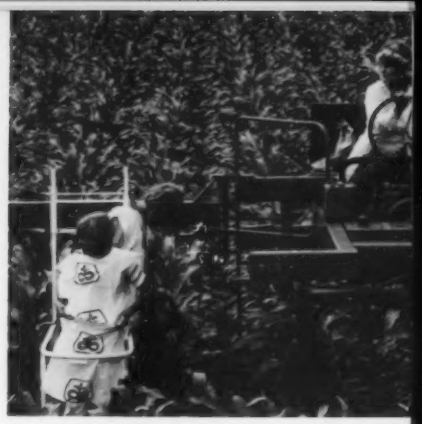
USDA's 1980 study of the casein question was prompted by concerns about casein's impact on the U.S. dairy industry and USDA dairy program costs.

Although the study found little, if any, natural cheese displaced by casein imports, it concluded that more domestically produced skim milk solids would have been consumed had there been no casein imports in 1980.

However, the study also noted that a total elimination of imports is not possible under current international trade agreements. Under the most stringent policy measures, the analysts estimated that government purchases of NDM would have been reduced by only about $10 million in 1980.

Additional considerations include the impact of trade restrictions on food manufacturers and consumers who use casein-based products. A restriction of any type on imports—quotas or tariffs—would probably cause casein prices to increase and manufacturers to look for alternatives.

The Woman's Role in Agriculture



While homemaking still ranks high on their do-lists, many farm women are running tractors, caring for livestock, and balancing operating budgets.

These findings are supported by a recent study that provides fresh evidence of the significant role women play in the operation of U.S. farms. Sponsored by USDA and conducted by the National Opinion Research Center, the 1980-81 study included a survey of about 2,500 farm women and 570 men (mostly husbands of the women surveyed). The conclusion: Farming is usually a family affair, shared to varying degrees by husbands and wives.

The researchers also noted that farm statistics, farm policies and programs, and efforts to inform farmers sometimes fail to recognize the extent to which women are actively engaged in the business of agriculture.

The study found that farm women occupy virtually every point along the farm participation continuum, from total non-involvement in the operation to single-handed management. In a typical farm setting of both husband and wife, the man is frequently designated as *the operator*, but his wife usually shares in the farmwork and the decisions regarding the operation.

Nearly all (96 percent) of the farm women in the study were married at the time of the survey, most had household responsibilities which often included child care, and almost a third worked at off-farm jobs. Despite these time-consuming activities, however, most of the women also reported a variety of farm-related duties.

The majority had at least some responsibilities for bookkeeping, running farm errands, and caring for a home garden or for animals intended for family consumption. In addition, many performed much heavier tasks, such as operating machinery.

From one-third to one-half the women were involved in fieldwork and harvesting, making major farm purchases, marketing farm products, and supervising hired or family labor. On livestock operations, about two-thirds contributed to animal care, including herding livestock and milking dairy cows.

Younger wives were more likely to tackle heavier farm jobs, reducing the need for hired labor until children could take over. In general, older wives had a smaller physical workload but not a smaller voice in management decisions.

Perceptions of Partnership

Although the analysis suggested that few wives made final farm decisions entirely on their own, half said they and their husbands shared in such major decisions as buying and selling land or equipment. Another third were involved in joint decisions on such matters as renting land, timing product sales, and changing production practices.

Overall, 55 percent of the women considered themselves to be a partner with their husbands in operating the farm. Nine out of ten also said they were satisfied with their level of responsibility in making farm decisions.

In the survey of men, the husbands confirmed the reports of their wives. The researchers noted that they found no evidence that husbands undervalue the contributions of their wives to the management or day-to-day operation of the farm.

Despite the common sense of partnership, however, few women listed farming as their occupation on income tax forms. Most of those without off-farm jobs identified themselves as housewives.

On the other hand, six out of ten of the married women had some confidence that they could continue to run the operation if something happened to their husbands. Men were more likely to be confident of their ability to farm without their wives, but only six in ten were certain enough to say they could *definitely* continue.

Although about 60 percent of the women had grown up on a farm or ranch, many confessed reservations about farming as a way to earn a living. But, in general, the women, like their husbands, were quite satisfied with farming as a way of life. Half the women belonged to one or more agricultural organizations.

Policy Attitudes, Program Experience

In addition to investigating the roles of farm women, the study also looked at their farm policy preferences and their experiences with USDA farm programs.

On farm issues, both the men and the women in the survey expressed similar opinions. Dollars-and-cents issues emerged as the dominant concern when subjects were asked to identify the most important thing USDA could do to help farm and ranch people.

Forty-one percent of the women and 34 percent of the men considered it most important for USDA to defend the producer's ability to make a living. When pressed for specifics, 25 percent of these women and 16 percent of these men said USDA should take actions to increase farm prices. Another 6 percent of women and 9 percent of men said USDA should support farm incomes through price support and other economic programs.

Not all the responses were consistent. Many of those surveyed said the greatest need was to reduce government interference in the agricultural economy. Other suggestions included strengthening USDA's communications with producers and devoting more attention to the plight of smaller family farms.

When asked what USDA could do specifically for farm women, many said they had never considered USDA policies—or farm issues—in terms of gender. The

majority either offered no new response or they asked that help be channeled to their husbands or their farms.

Those who did respond to the question on women's issues in farming focused on the need for changes in inheritance and estate tax laws, improved education and information programs for farm women, and greater recognition for their contributions to agriculture.

The survey also asked about farm women's involvement in USDA price support, soil conservation, farm credit, and extension programs. Although the results showed no evidence that farm women believed they were unfairly treated or discriminated against in dealings with USDA, most were significantly less involved than men with farm programs and agencies.

According to the study, these differences probably reflect the different "activity profiles" of farm men and women. Men generally have higher involvement levels in farming operations than their wives, who usually have major homemaking responsibilities in addition to farm duties.

However, the researchers concluded that, the differences notwithstanding, farm wives earn the right to be considered as partners in the farm. The study's findings show that they make a substantial contribution, which often goes far beyond the traditional role of managing the household so husbands and other family members can be free for farm duties. □

[*This article is based on the results of a farm women's survey conducted by the National Opinion Research Center, a nonprofit organization affiliated with the University of Chicago, and on additional research and analysis provided by researcher Peggy Ross of the Economic Development Division, Economic Research Service.*]

Farm Women Report Some Involvement in All Major Farm Tasks[1]

Plowing, disking, cultivating, or planting Yes 37% No 63%	Applying fertilizers, herbicides, or insecticides Yes 17% No 83%
Harvesting crops or other products Yes 51% No 49%	Doing other fieldwork without machinery Yes 42% No 58%
Taking care of farm animals, including herding or milking dairy cows Yes 66% No 34%	Bookkeeping, maintaining farm records, paying bills, preparing farm tax forms Yes 78% No 22%
"Yes" totals indicate percentages of farm women identifying the task as a regular or occasional duty.	
"No" totals indicate percentages of farm women reporting that they never perform that task.	
Running farm errands, as in picking up repair parts Yes 85% No 15%	Making major purchases of farm supplies or equipment Yes 37% No 63%
Marketing products, dealing direct with wholesale buyers or consumers Yes 33% No 67%	Taking care of home garden or animals for family consumption Yes 88% No 12%
Supervising farmwork of other family members Yes 50% No 50%	Supervising farmwork of hired farm workers Yes 36% No 64%

[1]Those who said a task did not apply to their farm are excluded from totals.

Solar Power On the Farm

Agriculture already uses more solar energy than any other industry, but human ingenuity can't take the credit. Aside from photosynthesis in crops, solar power's potential on the farm remains largely untapped.

Is solar energy destined to play a larger role in agriculture? The future is too uncertain to predict, concludes a recent report by Walter Heid and Warren Trotter of USDA's Economic Research Service. However, the two economists also point to significant progress in harnessing solar energy and reducing the barriers to greater farm use.

Public and private research and development work continues, despite a cutback in federal funding for solar projects. According to Heid and Trotter, solar technologies will have many new farm applications if scientists, manufacturers, and backyard inventors succeed in overcoming some of the technical and economic shortcomings of current systems.

"Many existing systems have already proven their worth in reducing energy costs for some farm tasks, such as drying grain. For most farm uses, solar technology still cannot compete with conventional energy sources, but the future may tell a different story," Heid says.

"In the lifespan of a new technology, solar is just coming out of the Stone Age. Many systems in use on farms today are homemade or individually hand-manufactured."

Most farm solar devices are nonconcentrating, flat-plate solar collectors, which simply absorb and distribute sun-generated heat. Few store heat. Until recently, these collectors have been designed for fixed, single-purpose farm uses only—with each use requiring a different system.

Despite these limitations, such collectors are already cost-competitive for certain farm tasks. Heid and Trotter indicate that hundreds of U.S. farmers are using them successfully for drying grain and for heating and cooling farrowing and nursery barns. Solar water heating for dairies also is economical now, although conservation of waste heat costs even less (using heat exchangers to transfer the waste heat from the milk to the water as the milk is cooled).

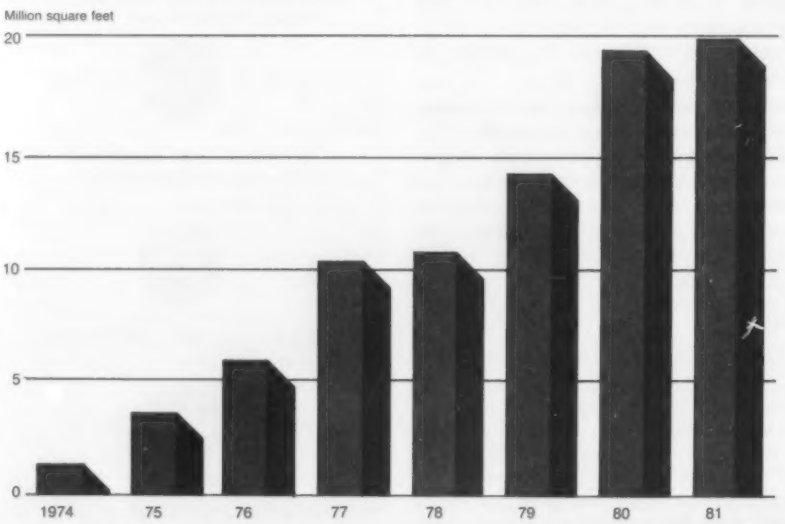
Researchers are now focusing on portable, multipurpose collector designs, which will be needed to attract a broader farm market. The increased flexibility of these collectors will allow farmers to spread their investment cost over more uses, thus shortening the payback period.

Potential for Advanced Systems

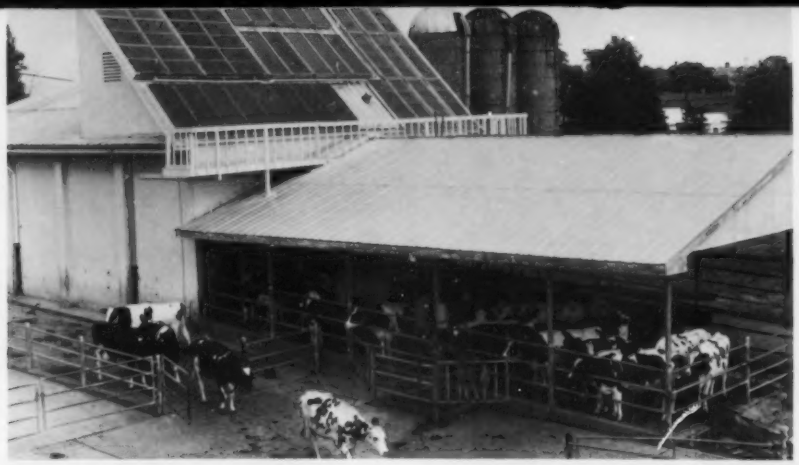
Even more promising are the emerging systems that may be widely available by the 1990's. The two solar technologies getting the most attention—concentrating collectors and photovoltaics—can provide types of energy the simple flat-plate designs cannot: high-grade heat and electricity.

Although they are making inroads in the commercial energy market, concentrating solar collectors still require more research for farm applications. Using mirrors or lenses, these devices concentrate sunlight, yielding much higher temperatures than the flat-plate systems.

Solar Collector Manufacturing Activity: Will Growth Continue?



Source: Department of Energy



USDA scientists use solar collectors to heat the wash water and the milking parlor in Beltsville, Maryland.

Solar collectors can cut energy costs in drying grain.

Concentrating collectors could be used to:

- Provide high-grade heat for processing farm products.
- Produce electricity for powering irrigation systems.
- Provide heat and electricity for farmhouse needs.
- Produce hydrogen, which may one day be used to fuel farm equipment.
- Produce other fuels and chemicals for farm production needs—including ethanol and nitrogen fertilizer.

Photovoltaics may eventually be the preferred solar technology for generating electricity. Made of silicon, photovoltaic cells generate electricity on contact with sunlight. Batteries are required to store energy for use at night and on cloudy days.

The silicon panels in use today, however, are only about 10 percent efficient and cost $7 to $15 per peak watt (cost of electricity during hours of peak sunlight). The comparable price of conventional electricity is still much lower.

Nevertheless, photovoltaics' costs have fallen 50 percent since 1976, and they will continue to drop rapidly as the market grows, as cell production becomes automated, and as cell efficiency improves. This technology will be competitive with public utility electricity if we reach the Department of Energy's goals for electricity from photovoltaics of $1.60 per peak watt by 1986 and 70 cents by 1990. "The photovoltaic industry is quite optimistic that these goals can be achieved," Heid says.

In 1980, electricity provided about 8 percent of all energy used on farms, and electricity use in agriculture is increasing at almost twice the rate of all other farm energy sources. Thus, the potential farm market for this technology is large. Heid and Trotter report that photovoltaics already are an economical alternative for powering electric fences and remote livestock watering stations.

A further plus to the development of photovoltaics is that farmers and others can sell their surplus electricity to public utilities. Some small power producers are already doing this, and the practice should grow significantly during this decade.

Fossil Fuels and Market Evolution

Besides potential breakthroughs in the advanced solar technologies, solar's future share of the farm energy market will depend on changes in the cost of fossil fuels and evolution of the farm market for existing solar technology.

A barrel of oil now costs nine times what it did in 1972. The higher oil prices go, the more attractive solar energy investments will be for farmers. Increasing electricity rates will also stimulate greater interest in the solar alternative. In fact, investments in solar technologies will probably grow cheaper as the cost of fossil fuels and public utility rates rise.

"As solar products improve and are accepted by the public, manufacturers will devise methods of mass production—leading to price reductions potentially as great as those in the computer industry," Heid says.

The production of flat-plate collectors has soared since 1974, from 1.3 million square feet to an estimated 19.4 million in 1980. However, the agricultural market accounted for only 5 percent of the 1980 sales.

All About Solar

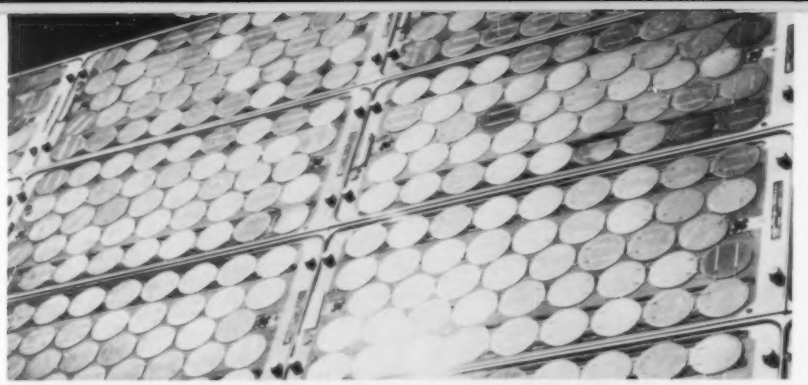
In a 112-page report, Walter Heid and Warren Trotter explore the progress and potential of solar energy systems for farm use.

They discuss alternate solar energy technologies, market growth, economic feasibility, promising and not-so-promising farm applications, and the successes and limitations of several solar research and development projects around the nation.

Their report also includes an extensive bibliography as well as the names and addresses of companies, organizations, and government agencies that provide: testing and certification of collectors, designs for do-it-yourself solar systems, and information on other solar subjects.

To order a copy of the report, send a check or money order for $5 to Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Ask for the report by title and GPO stock number: **Progress of Solar Technology and Potential Farm Uses,** stock number 001-000-04290-4. Or call (202) 783-3238 and charge it to your Visa, MasterCard, or GPO Deposit Account.

Researchers at Mississippi State install solar collectors on a poultry house.



Photovoltaic cells power an experimental irrigation project near Mead, Nebraska.

So far, the collector industry has concentrated mainly on penetrating the residential market, largely ignoring the manufacture of products developed for farm uses. As a result, commercially manufactured collectors are either not suitable or are too expensive for most farm applications.

Up to now, most farmers investing in solar collectors have relied on homemade designs developed through public research. These homemade collectors—some available in kits—may still be farmers' best choice. However, there are obstacles to this option, too. For one thing, no standard method exists for certifying the value of homemade collectors for lending and tax credit purposes. Also, the materials needed for proper construction are not widely available.

Until a component marketing system is developed, along with financing and technical services, farmers are not likely to show widespread interest in low-cost, homemade collectors.

"Barring some public assistance in transferring the technology from laboratory to farm, the market for solar thermal energy on the farm will depend on the success of manufacturers in enlarging the residential market," Heid says. "This eventually will bring down the price of commercial collectors and lead to more appropriate designs for agricultural uses." □

[*Based on material provided by agricultural economists Walter G. Heid, Jr., and Warren K. Trotter of the National Economics Division, ERS. Heid is stationed at the U.S. Grain Marketing Research Laboratory in Manhattan, Kansas, and Trotter is stationed at the Richard B. Russell Research Center, Athens, Georgia.*]

Catching the Rays

Basically, there are two ways to trap and use solar energy. One is to let the sun's rays fall on an absorbing plate that converts the sun's radiation to thermal energy. This energy can then be used to heat water or air which, in turn, can heat or cool a building, dry grain, or—with concentrated heat—drive a turbine to generate electricity.

The other way is through photovoltaics—allowing sunlight to fall on an array of cells that directly convert radiant energy into electricity. Photovoltaic cells work by turning absorbed photons of light into electrons. Photovoltaic cells formed the solar panels that provided electricity for the Skylab space mission.

Collectors are the basic form of solar technology now used on farms, and they come in two general types: nonconcentrating (flat-plate) and concentrating (focusing). The more common type for most agricultural uses is the flat-plate collector.

The main component of a flat-plate collector is the absorber plate, usually made of copper, steel, or aluminum. It is painted flat black to improve thermal absorbency. Clear plastic, fiberglass, or glass is normally used on the collector's face, and its back is insulated with a rigid foam or fiberglass to reduce heat loss. A flat-plate collector can be used to heat either water or air. Most collectors now used on farms are the hot-air type.

In a hot-air system, the collector heats air as it passes over or through the surfaces of the absorber plate. The rate of heat transfer depends on the absorber plate's surface area and the speed of air flow. Fins or corrugations are typically used to enlarge this surface area and control air flow.

In a hot-water system, most collectors contain copper tubes for carrying water, which is heated and then flows out of the collector. Some designs have water flowing over the surface of the absorber plate, which may be made of black plastic or rubber instead of metal. Fluids other than water can also be used as the heat-transfer medium.

Some method of heat storage may augment flat-plate collector systems. Insulated water tanks are used with hot-water systems, while hot-air systems normally employ an enclosed bed of rocks. Depending on the amount of insulation, water and rocks can retain heat for 3 to 5 days.

Concentrating collectors, not yet widely adapted to agriculture, use mirrors, lenses, or both to concentrate rays of sunlight onto an absorber. They must be motorized for tracking the sun as the earth rotates.

In this type of collector, the absorber is usually a tube containing fluid. Fluid is pumped from a storage tank, through the tube to absorb heat, then back into the tank. Depending on the size of the reflector array and its effectiveness, concentrating collectors can achieve very high temperatures.

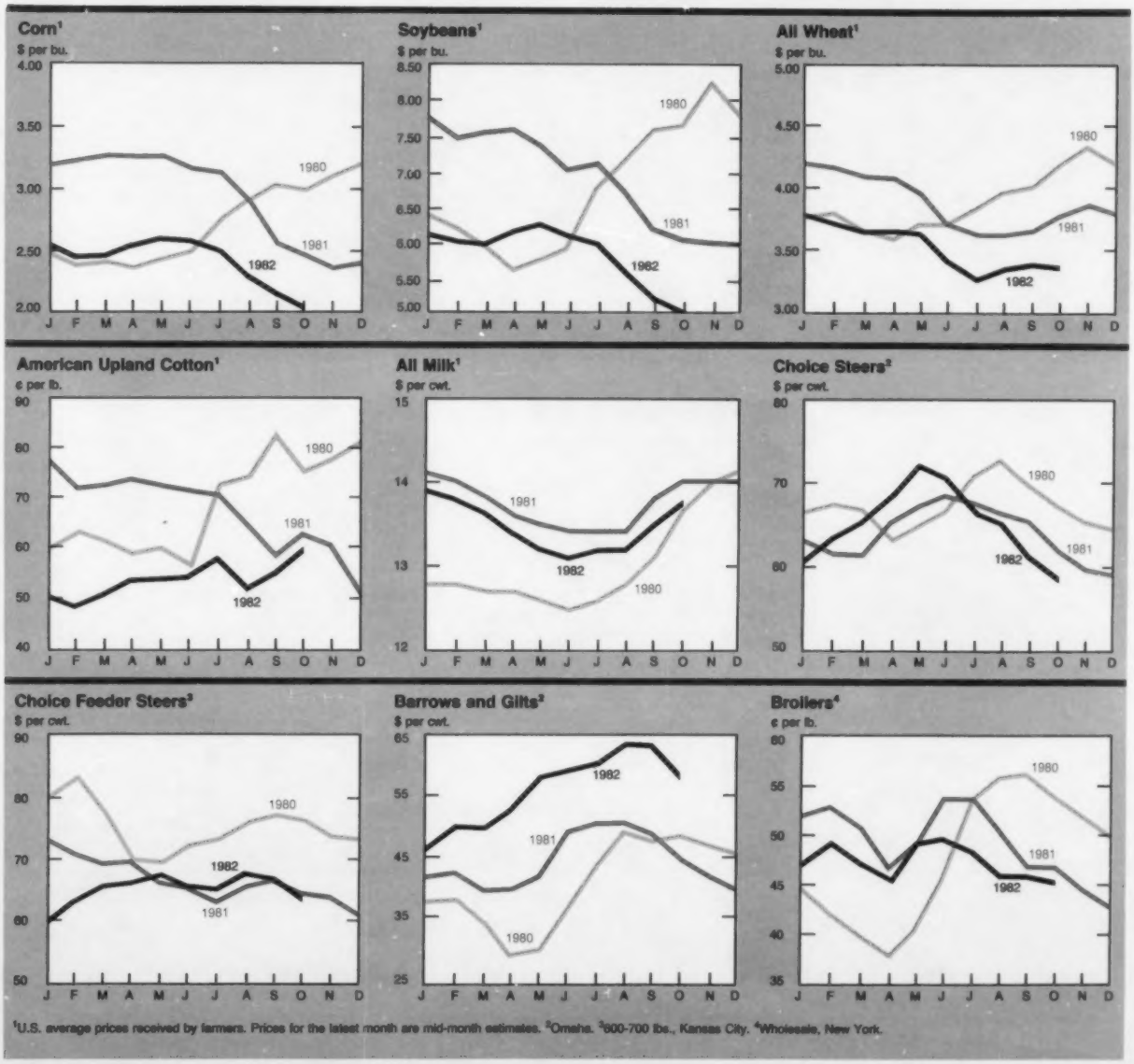
FARMLINE TRENDS

Monthly Price Monitor

USDA's October farm price index dropped 5% from September. Corn slumped to $2.03 per bushel, the lowest since fall 1978. Soybeans dropped to $5.03, the lowest since spring 1976.

Wheat prices held fairly steady, while cotton rose to 59.5¢ a pound—the highest this year. Milk prices were up, while Choice steers dropped below $60 per cwt for the first time this year. Prices of

Choice feeder steers declined, while broilers held between 45¢-46¢ per pound. Barrow and gilt prices dropped sharply, but remained well above year-earlier levels.



[1]U.S. average prices received by farmers. Prices for the latest month are mid-month estimates. [2]Omaha. [3]600-700 lbs., Kansas City. [4]Wholesale, New York.

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